XXVI. *Conjectures relative to the Petrifactions found in* St. Peter's *Mountain, near* Maeſtricht. *By* Petrus Camper, *M. D. F. R. S.*

Read July 6, 1786.

THE diſcovery of a great number of petrified bones about the year 1770, in the mountain of St. Peter at Maeſtricht, and particularly of large jaw-bones with their teeth, ſuggeſted to the late M. Hoffman, firſt Surgeon to the Military Hoſpital at Maeſtricht, a worthy member of ſeveral learned Societies, and a great admirer of natural hiſtory, the idea that theſe maxillæ belonged to crocodiles. This notion was ſpread by himſelf and his literary correſpondents through all Europe.

He did me the favour to ſend me, not only the hiſtory of thoſe petrifactions, but alſo ſeveral figures of the jaw-bones in queſtion, and of other bones, which were all intirely new to me, except ſome fragments of the bones of turtles. I diſcovered, however, at the very firſt ſight, the characteriſtical differences which diſtinguiſhed theſe bones from thoſe of crocodiles, of which I had at that time ſeveral in my collection.

His intention was to write upon this ſubject, and to ſend his eſſay, containing his reaſons for ſuppoſing theſe bones to belong to crocodiles, to the Royal Society; but I diſſuaded him, as a friend, from doing this, leſt he ſhould afterwards be under a neceſſity of retracting his opinion: and I ſent him a figure of

the

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the lower jaw of a crocodile, accurately done by my own hand, and ſoon after the ſkull and under jaw of a pretty large crocodile; which induced him to defer his deſign of writing about theſe antiquities of the old world, until he ſhould be better informed on the ſubject of cetaceous fiſhes.

Major DROUIN, of Maeſtricht, who made, about the ſame time, a collection of an infinite variety of corals, madrepores, alcyoniums, echinites, belemnites, ſhells, and petrified wood, from the ſame mountain and its environs, likewiſe procured a beautiful ſpecimen of two maxillary bones of the ſame incognitum, but with the inſides turned outwards; and this gentleman alſo ſuppoſed them to belong to the crocodile. A ſketch of this ſpecimen is to be found in M. BUCHOZ's *Dons de la Nature*, tab. 68. But the ſpecimen itſelf is now in TEYLER's Muſeum, at Haerlem, with the whole of Major DROUIN's collection.

Another ſtill more valuable and perfect ſpecimen is to be ſeen at the houſe of the reverend Dean GODDING, of which there is likewiſe a rough ſketch in M. BUCHOZ's *Dons de la Nature*, pl. 66. In this the greater part of both the upper and under maxillary bones is intire, and a bone, with ſmall teeth, belonging to the palate; by which it appears, the animal had not only teeth in the jaw-bones, but alſo in the throat, as ſeveral fiſhes have, but which are never found in the mouth of crocodiles.

Notwithſtanding all my endeavours to convince my friends, and afterwards M. DROUIN, and particularly the Dean, whoſe valuable and truly beautiful ſpecimens I ſaw in the year 1782, I never could prevail upon them to adopt my opinion, that theſe bones belonged to phyſeteres or reſpiring fiſhes. M. HOFFMANN, adhering cloſely to the Linnæan Syſtem, objected,

jected, that the phyſeteres had teeth only in the lower jaw-bone, whereas this foſſil monſter had them in both upper and lower maxilla. He did not ſeem to recollect, that φυσητηρ ſignifies ſomething reſpiring, or breathing, and applied to fiſhes, *breathing fiſhes*; nor that the phyſeteres, according to the Linnæan ſyſtem, have ſmall teeth in the upper jaw-bone, though larger ones in the lower jaw, according to the obſervations of Dr. OTHO FABRICIUS, in his Fauna Groenlandica, p. 42. where he mentions the *macrocephalus*, and p. 45. where he ſpeaks of the *microps*.

In Auguſt 1782, I ſent M. GODDING, who had favoured me with a copy of his valuable ſpecimen, a full demonſtration of its being the head of a phyſeter, or breathing fiſh, Delphinus, or Orca, or under whatever genus it may be ranked, as having large teeth of the ſame ſize in both the maxillæ. But in vain; for he continues ſtill to call it a crocodile, as if its value depended upon the ſpecies of the animal.

The analogy of all the other marine bodies ſeems to make it ſtill more probable, that theſe large bones belong to the inhabitants of the ſea, and not of rivers. The large turtles, the numberleſs echinites, madrepores, ſhells, alcyoniums, belemnites, orthoceratites, and ſo on, are all ſea animals; and the crocodile would, in that caſe, be the only inhabitant of the rivers mixed with them.

The pretended crocodile found near Whitby, in Yorkſhire, Phil. Tranſ. vol. L. p. II. 1758, § 92. p. 688. and ibid. § 108. p. 786. is undoubtedly the ſkeleton of a Balæna.

§ 2. After the deceaſe of M. HOFFMAN, his family having offered the whole collection for ſale, I went in Auguſt 1782 to Maeſtricht on purpoſe to examine it; and I could not but greatly admire the richneſs and beauty of the collection, eſpecially

cially that of the foſſil bones from St. Peter's mountain; but as the heirs did not conſider the expences neceſſary to tranſport the collection down the Maeſe, where each ſovereign puts an enormous duty upon every thing that paſſes through his territories, nor the ſmall number of perſons who were likely to purchaſe it, they rated the price ſo high that nobody choſe to bid for it.

The eldeſt daughter having at length become poſſeſſed of the whole, offered me the principal ſpecimens at a price I agreed to. Amongſt them were the duplicates I have already ſent to the Britiſh Muſeum, and with which the honourable Truſtees are perfectly ſatisfied. Theſe ſpecimens may ſerve likewiſe to aſcertain what I have ſaid about them, as being real fragments of phyſeteres, ſome of turtles, and the like, but not a ſingle one of any ſpecies of crocodile.

§ 3. The arguments for their being jaw-bones and vertebræ of fiſhes ſeem to be, firſt, the ſmoothneſs of theſe bones; and, ſecondly, the many holes by which the nerves go out at the ſide, and under each tooth, as is very evident in that beautiful ſpecimen now in the Britiſh Muſeum, on the outſide of which eleven holes are viſible, in the ſame manner as they are in the delphini, and more particularly in the lower jaw-bone of the cete, the Phyſeter macrocephalus, or pot-fiſh, cachalot, &c. Thirdly, the form of the teeth, which have ſolid roots, as in tab. XV. fig. 6. B, C, E, F, and the ſix teeth of tab. XVI. Fourthly, becauſe there are little teeth in the palate, as in Dean GODDING's ſpecimen. Fifthly, becauſe the vertebræ have the appearance of true cetaceous vertebræ, as in fig. 5. tab. XV. and in ſeveral beautiful and large ſpecimens now in the Muſeum. Several of theſe vertebræ were beſides intirely unknown to me, and not at all analogous to the vertebræ of the crocodile, deſcribed and repreſented by Dr. N. GREW.

§ 4. As I intended to viſit London in 1785, I flattered myſelf I ſhould ſtill find the ſkeleton of the great crocodile formerly at Greſham College, and be able to find out ſuch characteriſtic diſtinctions as ſhould be neceſſary to decide the queſtion. Dr. GRAY was ſo kind as to go with me to the lower apartments of the Britiſh Muſeum, where we found, though not without difficulty, the ſkeleton much neglected, ſpoiled, and deprived of ſeveral intereſting parts. I admired, nevertheleſs, the remainder of it, being infinitely pleaſed with the tranſverſe ſutures, tab. XV. fig. 1, 2. *a*, *b*. *c*, *f*. δ, ζ. by which not only thoſe of the neck and thorax, but thoſe of the loins alſo, are divided, and which I made a drawing of, as large as the life, the 20th of October, 1785, of which fig. 1. and 2. are very accurate copies.

I confeſs I had not obſerved that particular diviſion or ſuture in the ſkeleton of a ſmall crocodile, of thirteen inches, made by my youngeſt ſon; but after being apprized of it by the large ſkeleton in the Muſeum, of twelve feet four inches, Paris meaſure, on looking at my own when I returned home, I found them both alike, and that thoſe parts were not epiphyſes; of which, however, the tranſverſe proceſſes of the neck. fig. 1. *d*, *e*, *q*, *o*, *n*, *p*, have all the appearance, though there is no other epiphyſis to be obſerved in the reſt of the bones of that large ſkeleton.

When we compare the foſſil vertebra, fig. 5. with thoſe now in the Muſeum, we ſhall find the epiphyſes AB, CD, analogous to *a*, *b*, *c*, *d*, fig. 4. being the real epiphyſes in the vertebra of a young porpoiſe.

I procured, in London, the largeſt vertebræ of the neck of a turtle I could get, and prepared two of them as in fig. 3. in which, as along the back of that ſingular creature, I found the tranſverſe diviſions *a*, *c*, *d*, *f*: of all which I have not ſeen a ſingle inſtance amongſt the dorſal ſpinæ from St. Peter's mountain, one of which conſiſts of ſeven, another of twelve, and a third of fourteen vertebræ. Some of the vertebræ have, I acknowledge, an inferior proceſs, as in the crocodile, *l*, *m*, fig. 1. Of theſe I have ſent likewiſe two to the Muſeum. The oſtrich, and the turtle *Mydas*, have ſuch proceſſes, but no quadruped I know of.

The articulation of the vertebræ with each other, by the ſurfaces of the bodies themſelves, is intirely different, not only from that of the crocodile, but from that of all the cetaceous fiſhes I have ever ſeen: and I dare venture to aſſert, I have ſeen a great many, excluſive of thoſe in my collection. The anterior part of the Maeſtricht vertebræ is more or leſs triangular and hollow, as in fig. 5. C, D, L. The poſterior A B is convex. Both theſe ſurfaces are very ſmooth, as if they had been covered with a very thin cartilage, and moved one upon the other, without being united by an elaſtic lamella, as in all quadrupeds and cetaceous fiſhes; in which the vertebræ have on both the ſurfaces a round brim, or circular edge, *a*, *h*, *i*, *b*, by means of which the ligaments are connected, and a flat hollow ſurface within, as *h*, *i*, fig. 4. for the elaſtic pulp that is between them.

§ 5. The dentition is ſo ſingular in theſe foſſil jaw-bones that it deſerves a particular deſcription. In all quadrupeds, as in man, the teeth which appear firſt are all ſhed at a certain period of life, and in the mean time new ones are formed above, under, or at the ſides of the primordial or temporary teeth, but in different ſockets. The grinders are not all renewed, but in general three when there are ſix, and two when there are five. Nature, however, is not always uniform in this operation. Mr. JOHN HUNTER, a worthy Member of our Society, has given a very intereſting and complete natural hiſtory of the teeth, in which theſe obſervations are ſtated.

In the crocodile the ſucceeding or ſecondary teeth appear even when the animal's head is equal to two feet; that is, when it has acquired one-third of its uſual growth. When they grow too faſt, before the temporary tooth is ſhed, they perforate the ſide of the bone, at the part where they meet with the leaſt reſiſtance. Inſtances of this variety occur in the large crocodile's head, which is in my collection.

In all quadrupeds the enamel is, of the ſolid parts of the teeth, the firſt formed, making a cavity, in which the other bony ſubſtance is depoſited, and formed by lamellæ placed one within another, as is obſerved by Mr. JOHN HUNTER in the work already mentioned, p. 92. To this the root is added, which is filled in the ſame manner till the tooth is long enough to pierce through the gums.

But in the foſſil jaw-bones of St. Peter's mountain, a ſmall ſecondary tooth is formed, with its enamel and ſolid root at once, within the bony ſubſtance of the primordial or temporary tooth itſelf, as is to be ſeen in the ſmall fragment now in the Britiſh Muſeum, and in tab. XVI. A, B, C, D, E; which, by continuing to grow, ſeem to make by degrees ſufficient cavities in the bony roots of the primary teeth: but what becomes of them at laſt, and how they are ſhed, I am not able to gueſs. I have one in my collection, where the ſucceeding tooth is intirely formed within the center and ſubſtance of the primordial tooth. In the 6th figure (tab. XV.) a little oval cavity is obſervable,

obſervable, which has been the ſeat of a new or ſecondary tooth.

§ 6. The maxilla inferior of the incognitum, ſent by me to the Britiſh Muſeum, is a moſt magnificent ſpecimen, having fourteen teeth. A ſimilar one, ſomewhat longer (as it meaſures 3⅔ feet) in my own collection, has alſo fourteen. Another fragment of the left ſide, two feet long and eight inches broad, ſhews the primordial and ſucceeding teeth in the cleareſt manner.

The ſpecimen, of which I ſent a drawing (tab. XVI.) to the illuſtrious Preſident of our Society, Sir JOSEPH BANKS, is ſtill more uſeful to confirm the mode of dentition than any other I have in my muſeum.

§ 7. Several ribs and the phalanges of the toes of the fore-feet, a ſpecimen of which I ſent in a fragment from the ſame rock, of about a foot long and eight inches broad, may ſerve as another proof of the difference between theſe and the crocodile's toes, when compared with the ſtill valuable, though neglected, ſkeleton in the Britiſh Muſeum; which I am ſorry I could not make a drawing of, having been too much employed on other objects.

All theſe characteriſtic differences cannot fail to convince the learned Society of the truth of what I have aſſerted, about the animal theſe bones belonged to; for though we cannot determine exactly the ſpecies itſelf, yet I flatter myſelf the preceding obſervations evidently prove, that they did not belong to any animal of the crocodile kind.

§ 8. Another very beautiful ſpecimen, a foot and a half long, and about ten inches broad, I have been induced to add, becauſe it contains the anterior part of the ſcutum of a very large turtle. Of this Mr. JOHN HUNTER has an analogous bone

bone from the ſame mountain in his valuable collection, but ſent to him under another name. I am convinced it belonged formerly to a turtle; firſt, becauſe I have from the ſame mountain the intire back of a turtle, four feet long and ſixteen inches broad, a little damaged at the ſides, and a pretty large fragment of another turtle, in my poſſeſſion. 2dly, Becauſe I have a ſimilar one, but ſo placed within the matrix as to ſhew the inſide, which is perfectly analogous to the inſide of that piece in the back of a large turtle I got in London, by the favour of Mr. SHELDON. 3dly, Becauſe I have amongſt theſe bones the lower jaw-bone of a very large turtle, of which the crura, though not intire, are ſeven inches long, and diſtant from one another ſix inches; the thickneſs is equal to 1¼ inch.

All theſe fragments prove the frequency of turtle bones amongſt the other foſſil bones found in the mountain near Maeſtricht.

Dr. MICHAELIS wrote to me ſome time ago, that the abovementioned fragment, in Mr. J. HUNTER's Collection, belonged to a bird; which I could hardly believe, as I never had ſeen in any collection whatſoever, either in London, Paris, Bruſſels, Gottingen, Caſſel, Brunſwic, Hanover, or Berlin, nor in my own country, any foſſil bone belonging to a bird. I know there is a ſmall one deſcribed in the Abbé ROZIER's Journal de Phyſique, for March 1782, which is at preſent in the collection of M. D'ARCET, at Paris. I expect alſo from Montmartre a ſmall leg of a petrified bird; but theſe are the only ones I have ever heard of, thoſe of Stonefield, near Woodſtock, being moſt undoubtedly of fiſhes. I think it is a circumſtance worthy the attention of the curious, that no human bones,

bones, and of birds but very few, have been hitherto found in a petrified ſtate, and belonging to the old world.

PETRUS CAMPER.

Klein Lankum, near Franeker,
June 18, 1786.

EXPLANATION OF THE PLATES.

TAB. XV.

Fig. 1, 2. Are vertebræ taken from the ſkeleton of the crocodile deſcribed by Dr. NEH. GREW, in his Catalogue of the Natural Rarities at Greſham College, p. 42. and p. 43.

a, *b*. *c*, *f*. δ, ζ. the bodies of the vertebræ; *a*, *b* of the fourth; *c*, *f* of the firſt vertebra of the neck; β, *z*, *t*. and *x*, *y*, *w*. the ſpinous proceſſes; γ β. and *s*. the aſcending; *t*, and *u v*. the deſcending proceſſes; *g*, *h*, *c*, *i*. *d*, *e*, *n*, *p*, *o*, *q*. the tranſverſe, united by cartilages to the bodies of the vertebræ. GREW calls them *oſſa mucronata*. The tranverſe proceſſes of the fourth vertebra being loſt, the roots of the mucronated proceſſes are very evident at *g h*, *i k*.

On the under part of theſe vertebræ are (*l* and *m*) proceſſes, ſimilar to thoſe we find in the vertebræ of the neck in turtles and birds. Not only the ſix poſterior but the five anterior vertebræ of the back are provided with ſuch proceſſes; of theſe, however, Dr. GREW makes no mention.

Fig. 2. Repreſents the ſeventh vertebra of the back; A, and C. are the aſcending and deſcending proceſſes, forming the articulations with the adjacent vertebræ; B. the tranſverſe proceſs, to which is united the rib FB. in B.; DE. the ſpinous proceſs; H, H, I. the body of the ſame vertebra.

Theſe figures are as large as the life, and made from the ſame ſkeleton, now in the Britiſh Muſeum. The whole length is equal to $12\frac{1}{3}$ feet, Paris meaſure; the head equal to 2 feet; the neck equal to 1 foot; the trunk equal to 3 feet 8 inches; the tail equal to 5 feet 8 inches. The meaſurement given by Dr. GREW does not agree with mine; but he ſeems not to have taken it with great attention (p. 42.), for he makes uſe of the words *about*, *almoſt*, &c.

OBSERVATION. What ſtruck me was, the tranſverſe ſuture, *a*, *b*. *c*, *f*. δ, ζ. which divided the bodies of all the vertebræ of the neck, back, and loins. This diviſion ended with the os ſacrum, which was intire, as were alſo the vertebræ of the tail. Dr. GREW ſeems only to haven taken notice of the ſutures belonging to the tranſverſe proceſſes.

I have a ſmall ſkeleton of a crocodile equal to 13 inches, in which the 7 vertebræ of the neck, 12 of the back, and the 5 of the loins, are divided in the ſame manner as in the large ſkeleton in the Britiſh Muſeum. Thoſe of the os ſacrum and tail are without, and have no mark of an epiphyſis.

CONCLUSION. The tranſverſe diviſion of the vertebræ abovementioned is alſo peculiar to this animal; and there is no epiphyſis, as in other animals.

To be ſure of this, I diſſected and made a ſkeleton of the Lacerta Iguana, LINN. ſp. 26. perfectly well deſcribed by

MARCGRAF, *Hiſt. Braſ.* p. 236. cap. 11.; but I found no ſuch diviſions, though the animal was young, and though it had ſtill epiphyſes on the legs, &c. The neck conſiſts of 4 vertebræ, the back of 11, the loins of 9, the os ſacrum of 2, as in the crocodile; the tail of more than 60.

The diſſection of tortoiſes ſeemed to me of conſequence, at leaſt a more accurate inſpection of the vertebræ, particularly thoſe of the neck, as being analogous in ſome reſpects to thoſe of the crocodile, eſpecially in the ſtructure of the inferior proceſſes D, and E, with *l*, *m*, fig. 1.

Fig. 3. Repreſents two vertebræ of the neck of a pretty large turtle, natural ſize.

AB, BC. the bodies; L. and I. the aſcending, H. and T. the deſcending proceſſes; R. K. the ſpinous, *a*, *b*. *d*, *e*. the tranſverſe, and D. E. the inferior proceſſes.

a, *b*, *c*. *d*, *e*, *f*. the tranſverſe diviſion of theſe, ſimilar to that in the crocodile.

Fig. 4. A vertebra from the tail of a young phocæna or porpoiſe; in which *a*, *b*. is an orbicular plate, united by means of cartilage to the body of the vertebra *a*, *d*. which is provided with ſuch a one on both ſides, *a*, *b*. and *c*, *d*.

Thoſe bony lamellæ are the epiphyſes of the vertebræ, and are alike in all quadrupeds, to which claſs all the cetaceous fiſhes belong. When we conſider the ſtructure in general of theſe laſt, we find the hind legs only are wanting, and of courſe the oſſa innominata; but the oſſa pubis are very remarkable in all of them.

Fig. 5. Is a foſſil vertebra of the unknown animal, whoſe bones are ſo often met with in St. Peter's Mountain at Maeſtricht. A, B, C, D. is the body; C, I, K, E, F. the ſpinous proceſſes; C, K, I. the medullary canal, running under K, E, F, in a direction parallel to IF, and coming out again at F. The remaining marks of the lamellated epiphyſes I, D. and A, B. are evident proofs of the analogy between theſe and the vertebræ of the cetaceous fiſhes; and alſo of their want of reſemblance to the vertebræ of the crocodile, as will appear by comparing the firſt and ſecond figures with the fifth.

Fig. 6. Is a very accurate drawing of one of the foſſil teeth belonging to the ſame incognitum. A B C. is its point, of a lanceolated figure, whoſe edges B A, and A C, are dentated; B C. is the root, uneven, bony, fixed within the ſocket with D, G, F.; D, G, B, C. is covered with the gums; H, I. is an oval ſinuoſity, in which generally the ſecondary teeth are generated, as is ſeen in tab. XVI. repreſenting a fragment of the upper jaw-bone of the ſame incognitum, A, B, C, D, E.

The teeth in all the Phyſeteres and Delphini have ſolid roots, except in the young ones, in which they often have cavities to receive the blood-veſſels and nerves. But the crocodile has the teeth intirely hollow, as appears in

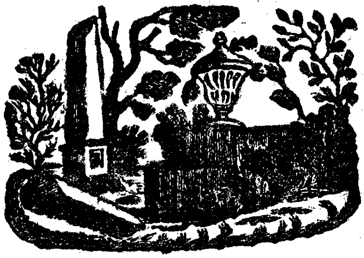
Fig. 7. in which the cavity Π, Δ, Θ, ſhews the difference between the crocodile's teeth and thoſe of the cetaceous and other fiſhes. This tooth is the anterior one of a large head of a crocodile, two feet long, and of the ſame ſize as that in the Britiſh Muſeum. A hollow tooth may notwithſtanding belong to a Phyſeter, as Dr. Otho Fabricius obſerves in his Fauna Groenlandica, p. 44. when ſpeaking of the Phyſeter microps: of which he ſays, "Habet in maxilla inferiori dentes

22,

22, utrinque 11 arcuatos, falciformes, *intus ad apicem uſque cavos*," within they are hollow to the very end.

TAB. XVI.

Fragmentum Maxillæ ſuperioris, lateris dextri capitis Phyſeteris incogniti, ex Monte St. Petri, Traj. ad Moſam. Origo dentium ſerotinorum ex ipſis radicibus ſolidis primo enatorum in quinque manifeſta eſt. Quæ ad dentitionem hanc ſingularem pertinent, ex figur. 2. Tab. Fragm. ſimilis ſed Maxill. inf. 12 Aug. 1784. peti debent.



Crocodili Nilotici

Colli Vert. IV.

Fig. 1.

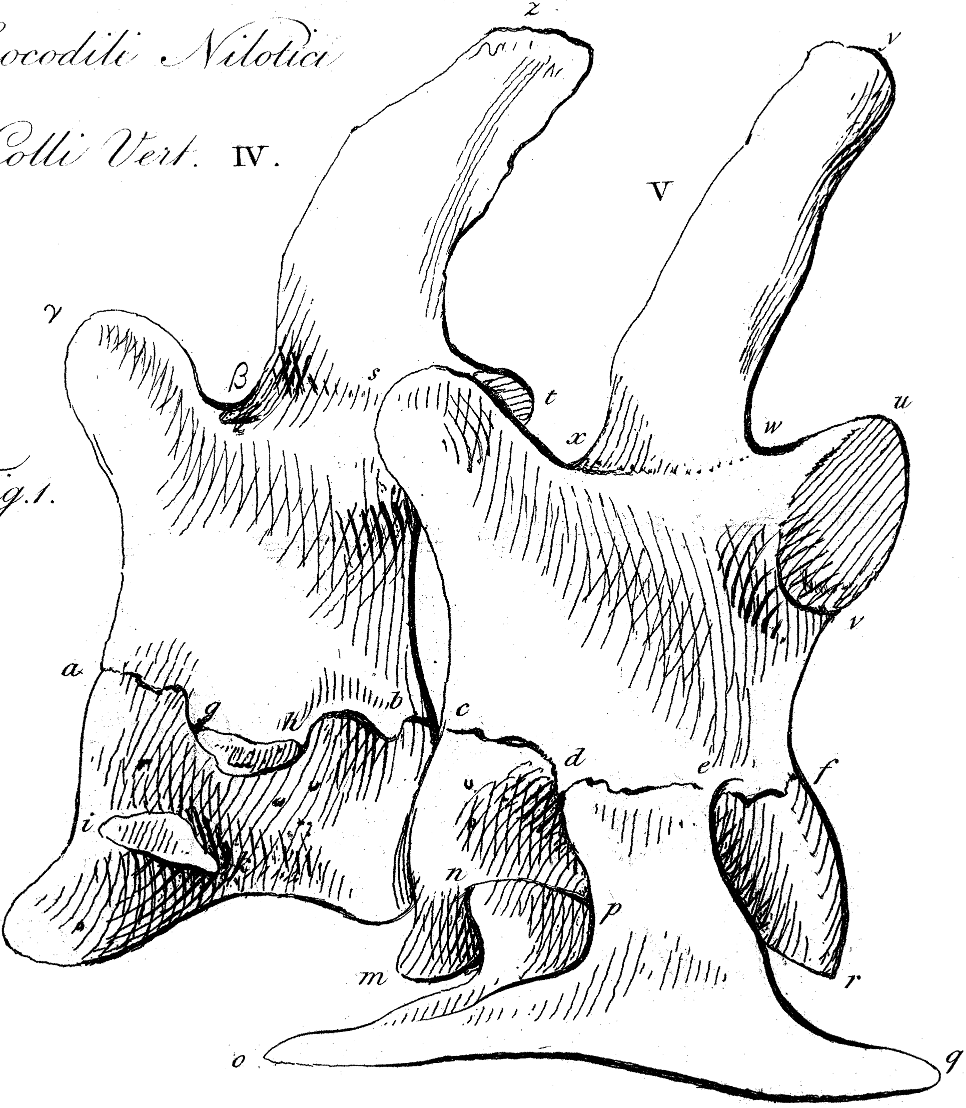
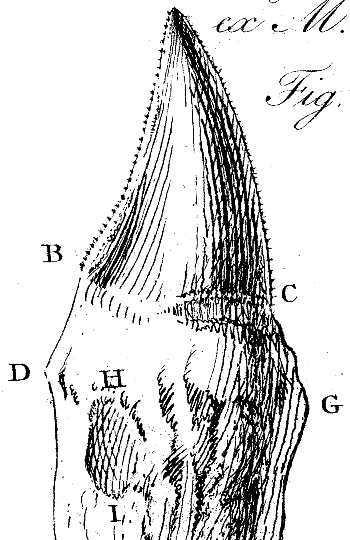


Fig. 2.

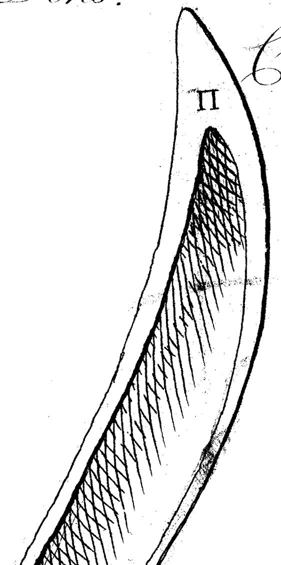
Physet. Incogn. Dens.
ex M. S. Petri.

Fig. 6.

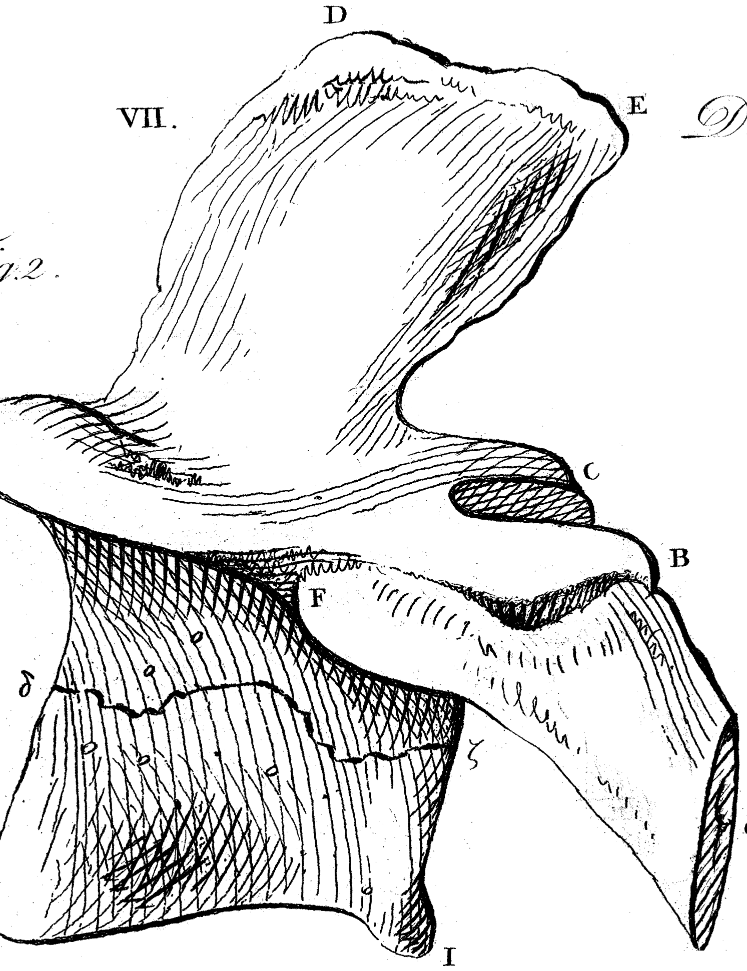


Crocodili Dens.

Fig. 7.



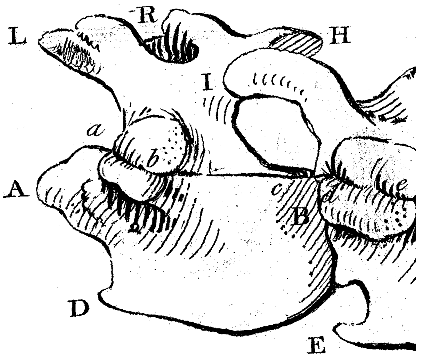
g.2.



Dorsi

Testudinis Ma
Vertebrae e

Fig.3.



s.

Physeteris Incogniti
ex Monte S. Petri.

Fig.4.

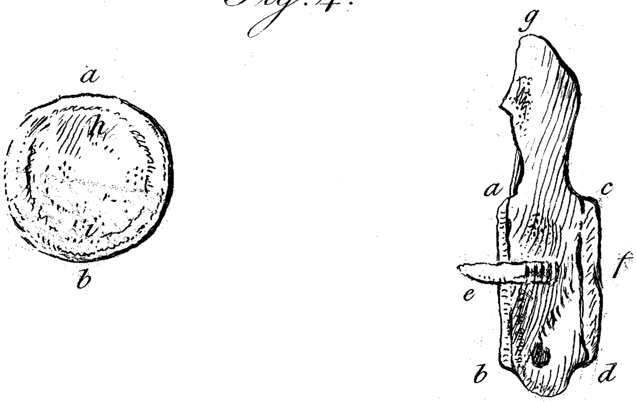
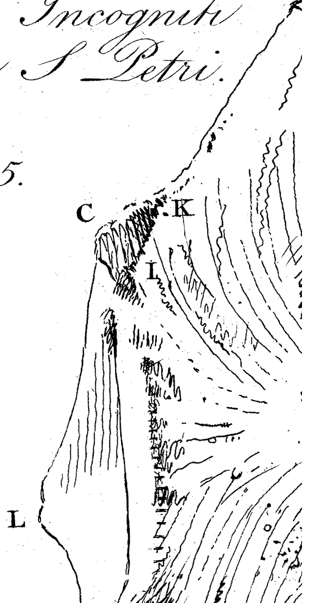


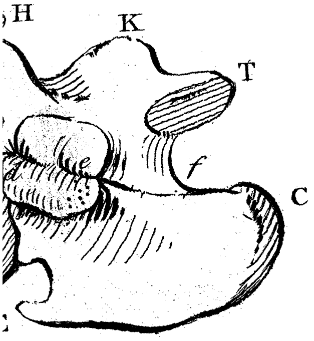
Fig 5.

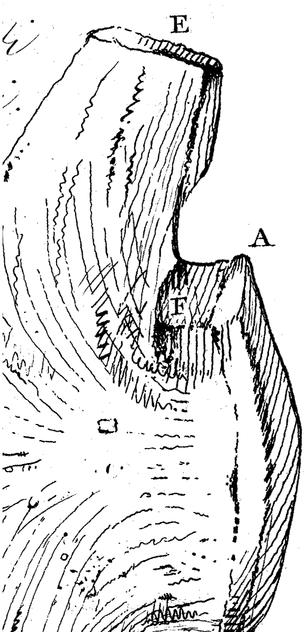


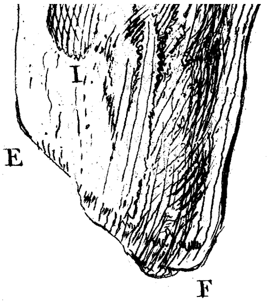
Marinae

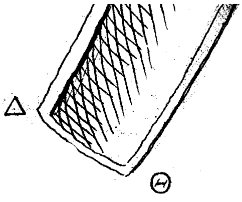
e Collo.

a.3.



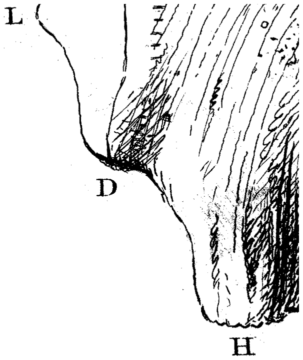


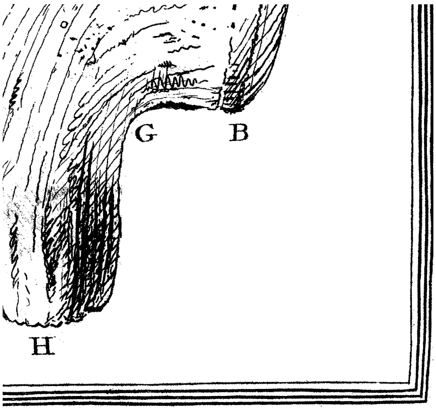




P. Camper f. Lancumi, 15 Junii, 1786.

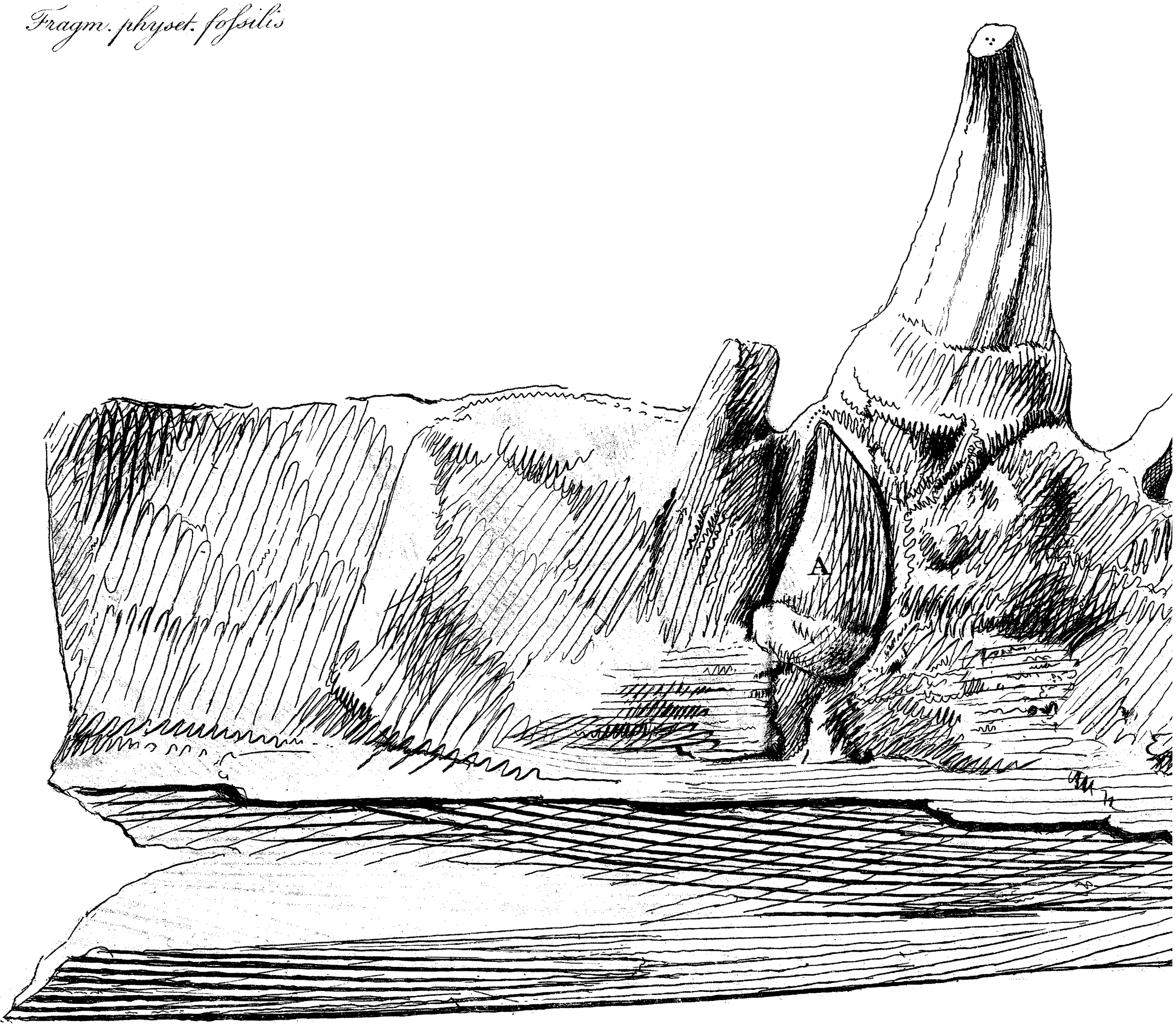
Vertebra e cauda Phocaenae Junioris.





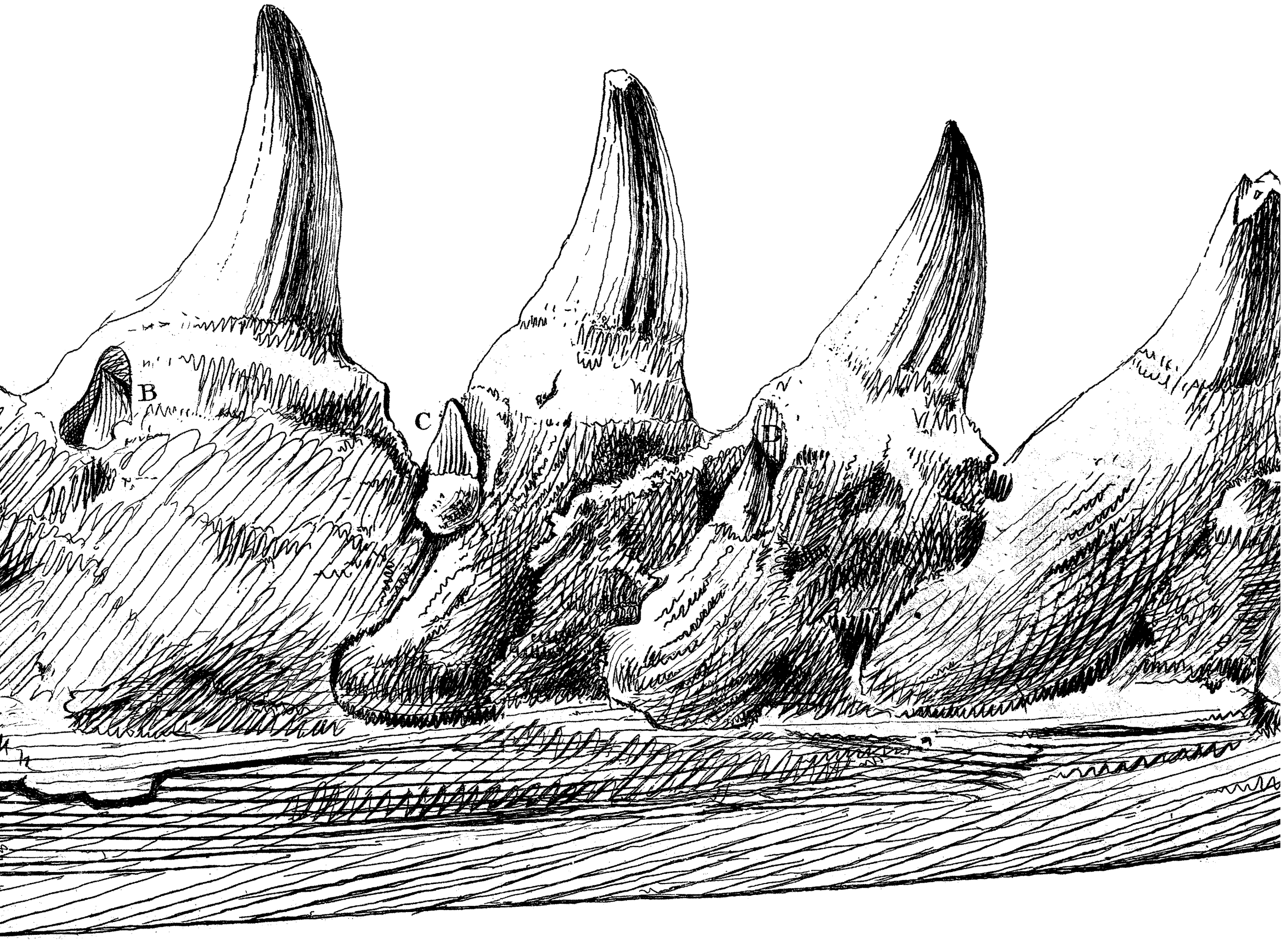
Baſire S.

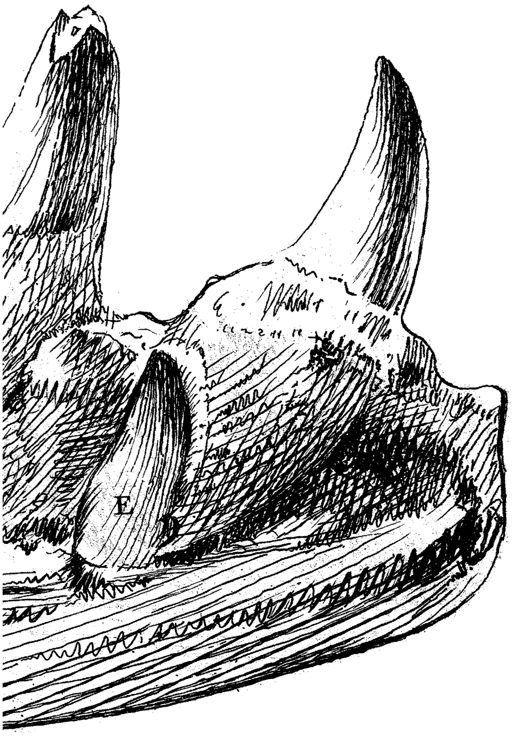
Fragm. physet. foſsilis



Ex Museo Petri Camper

P





P. Camper f
Lancumi 27 Maji
1785
magnit. natur

Basire S.

Crocodili Nilotici

Colli Vert. IV.

Fig. 1.

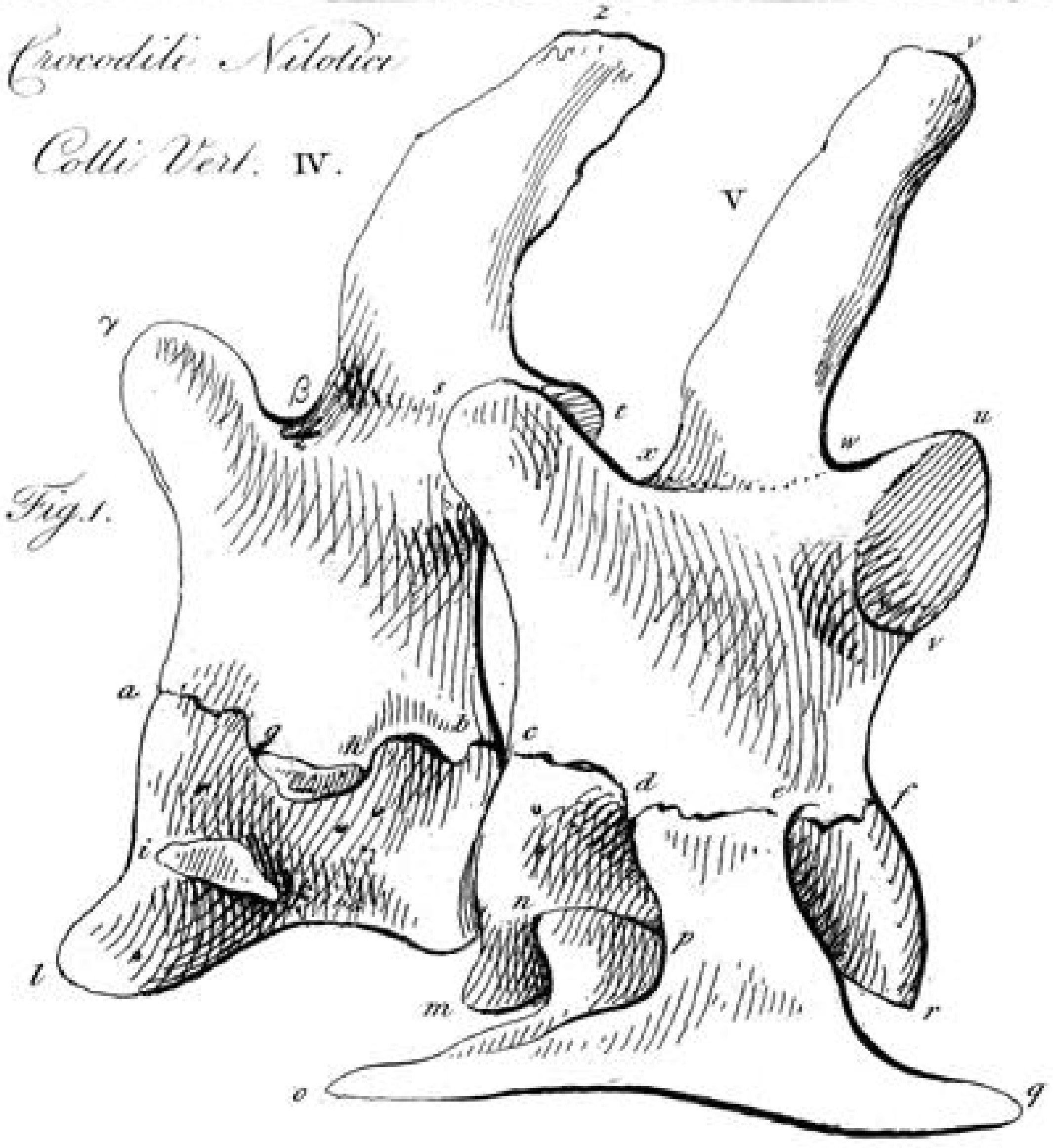
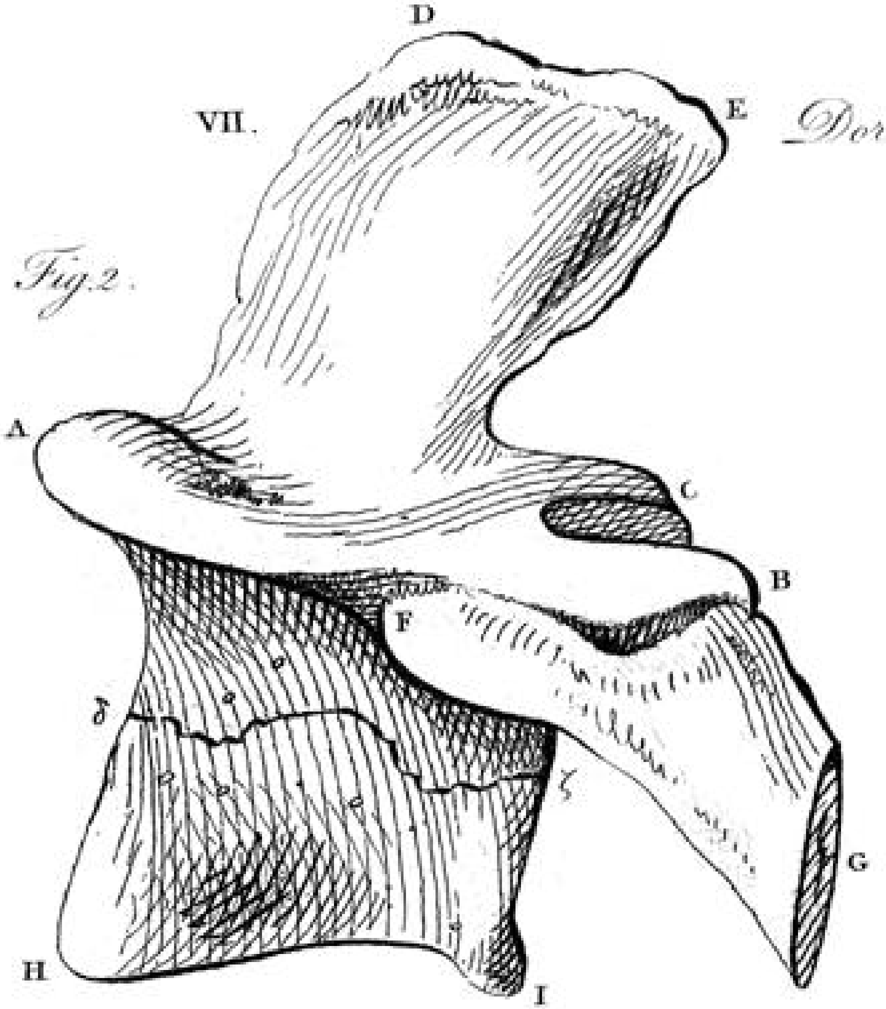


Fig. 2.

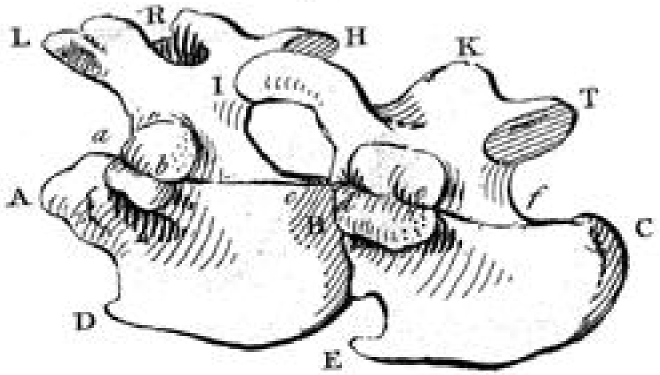
Dorsi



Testudinis Marinae

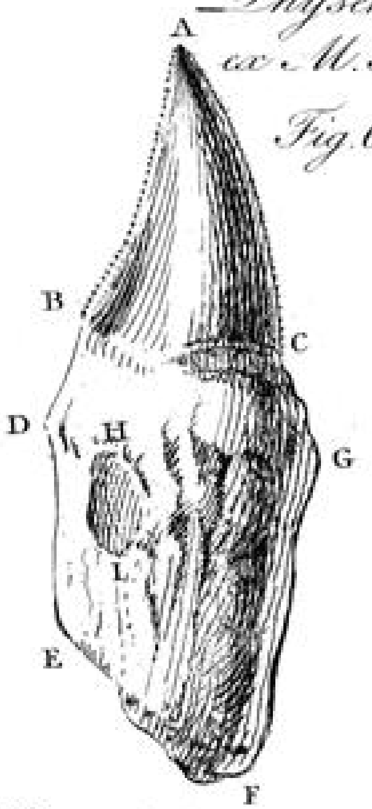
Vertebrae e Collo.

Fig. 3.



Physet. Incogn. Dens.
ex M. S. Petri.

Fig. 6.



Crocodili Dens.

Fig. 7.

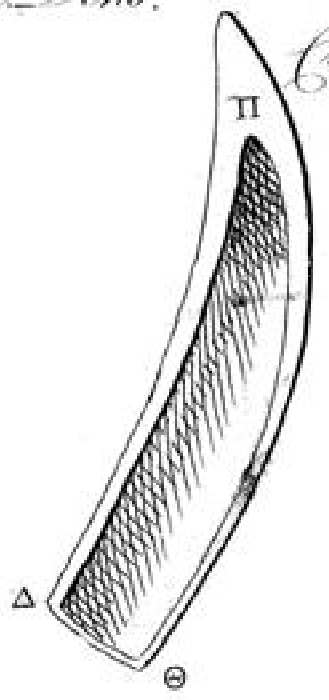
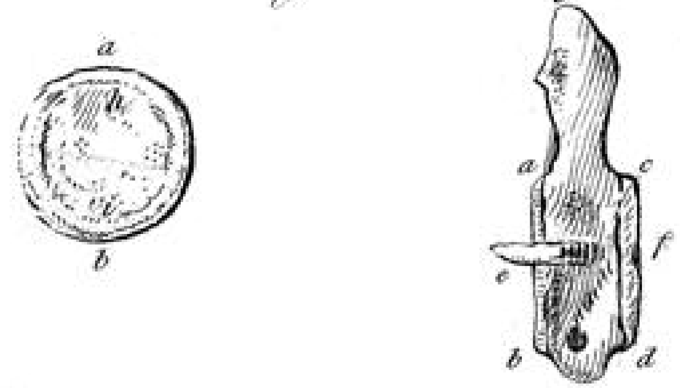


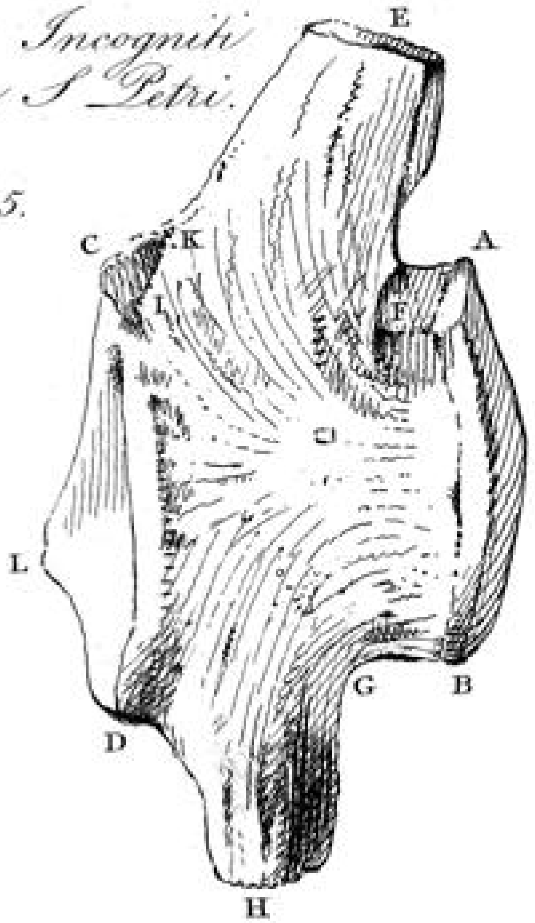
Fig. 4.



Vertebra e cauda Phocaenae
Junioris.

Physeteris Incogniti
ex Monte S. Petri.

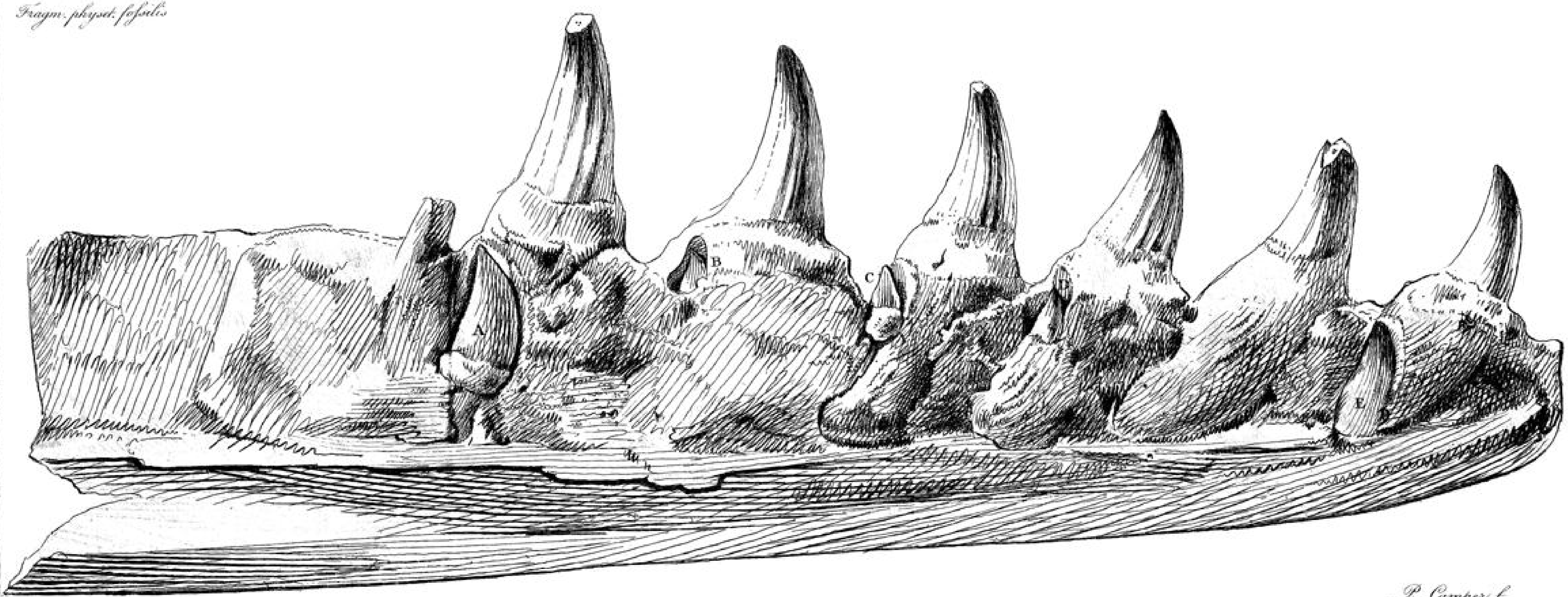
Fig. 5.



P. Camper f. Lancumi, 15 Junii, 1786.

Baſire S.

Fragm. physet. foſsilis



P. Camper f.
Lancumi 27 Maji
1785.
magnit. natur

Ex Museo Petri Camper

Basire sc.